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## **Infrared Emitting and Photoconducting Colloidal Silver Chalcogenide Nanocrystal Quantum Dots from a Silylamide-Promoted Synthesis**

Yarema, Maksym; Pichler, Stefan; Sytnyk, Mykhailo; Seyrkammer, Robert; Lechner, Rainer T.; Fritz-Popovski, Gerhard; Jarzab, Dorota; Szendrei, Krisztina; Resel, Roland; Korovyanko, Oleksandra

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**Supporting Information for**

***Infrared Emitting and Photoconducting Colloidal  
Silver Chalcogenide Nanocrystal Quantum Dots  
from a Silylamide Promoted Synthesis***

Maksym Yarema\*, Stefan Pichler, Mykhailo Sytnyk,  
Robert Seyrkammer, Rainer T. Lechner, Gerhard Fritz-Popovski,  
Dorota Jarzab, Krisztina Szendrei, Roland Resel, Oleksandra  
Korovyanko, Maria Antonietta Loi, Oskar Paris, Günter Hesser,  
and Wolfgang Heiss\*

*Institute for Semiconductor and Solid State Physics, University Linz, Altenbergerstr. 69, Linz 4040 (Austria)*

*Department of Inorganic Chemistry, University Chernivtsi, L. Ukrainky Str. 25, Chernivtsi, 58012 (Ukraine)*

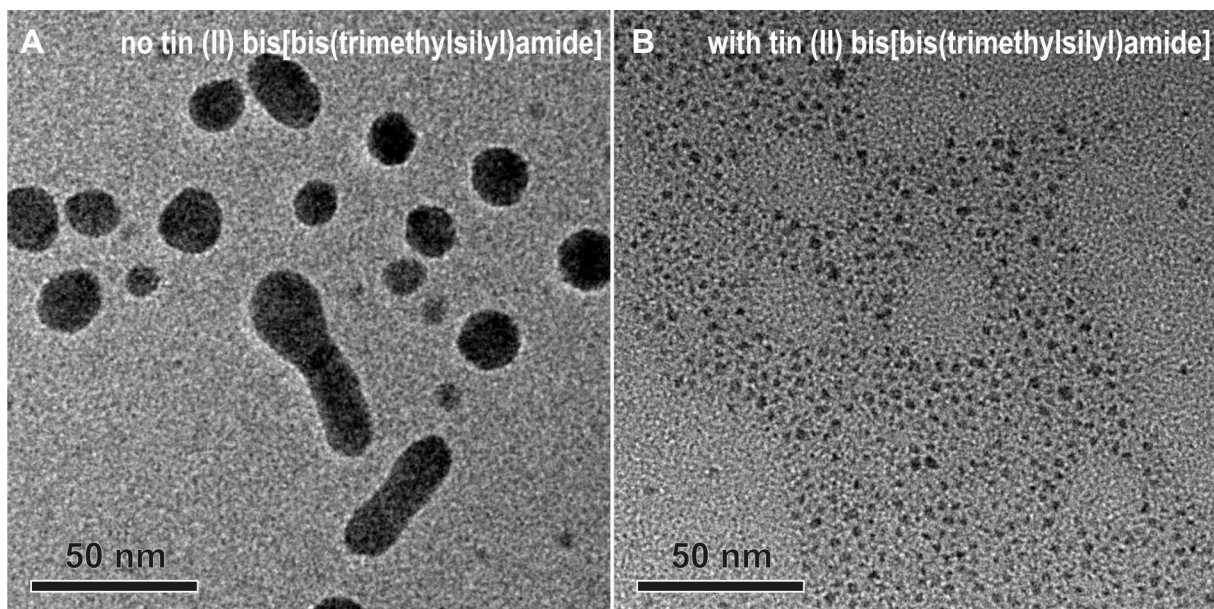
*Center of Surface and Nanoanalytics, University Linz, Altenbergerstr. 69, Linz, 4040 (Austria)*

*Institute of Physics, Montanuniversitaet Leoben, Franz Josef Str. 18, Leoben, 8700 (Austria)*

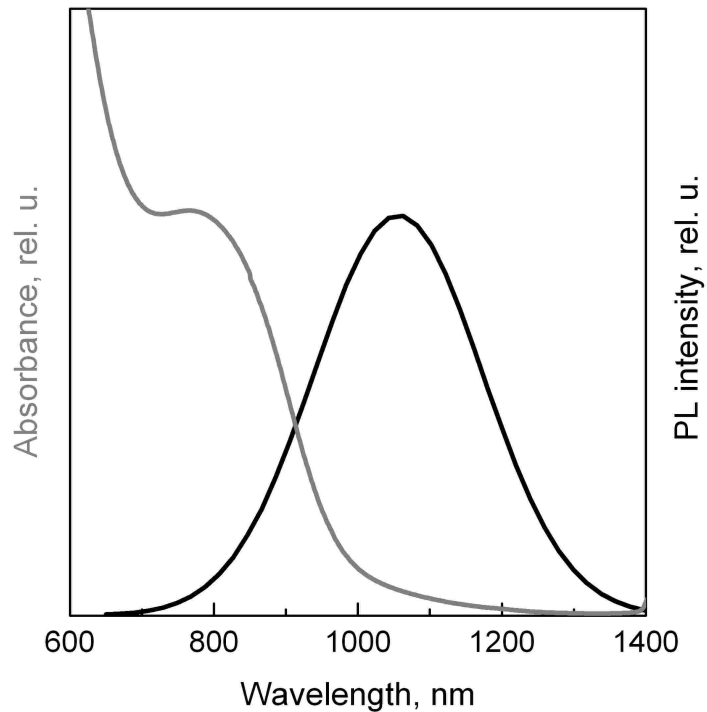
*Zernike Institute for Advanced Materials, University of Groningen, Nijenborgh 4, Groningen, 9747 AG (The Netherlands)*

*Institute of Solid State Physics, Graz University of Technology, Petersgasse 16, Graz, 8010 (Austria)*

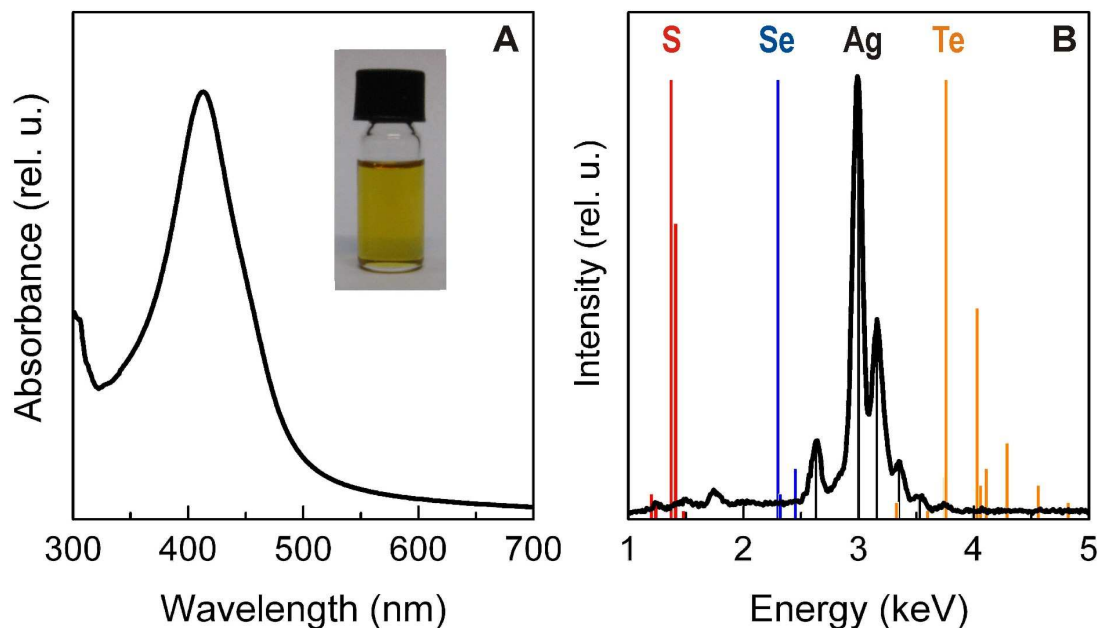
\* Email: maksym.yarema@jku.at, wolfgang.heiss@jku.at



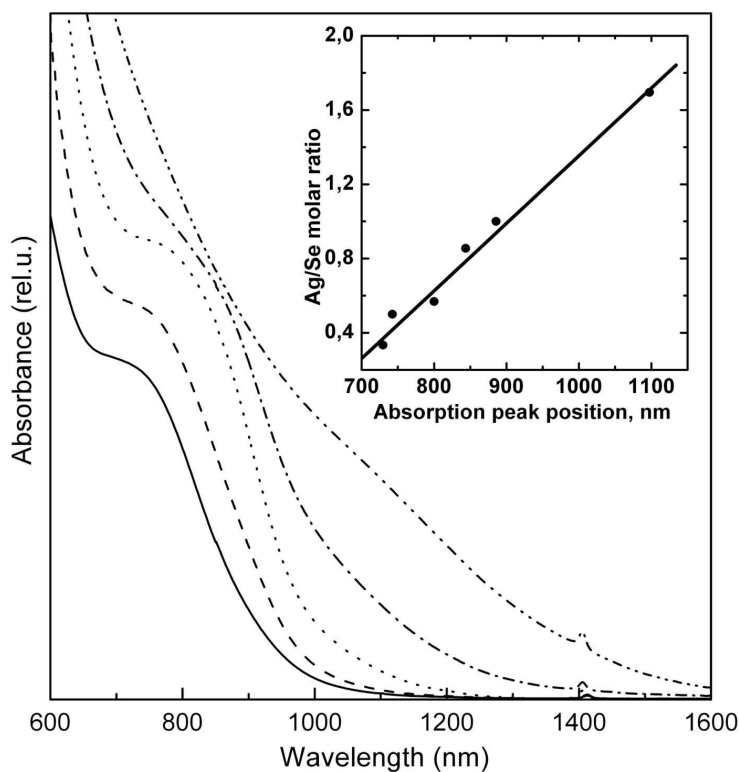
**Figure S1.** TEM images of  $\text{Ag}_2\text{Se}$  nanocrystals synthesized by a direct reaction between  $\text{AgTFA}$  and  $\text{TOPSe}$  in (A) and with addition of tin (II) bis[bis(trimethylsilyl)amide] (B).



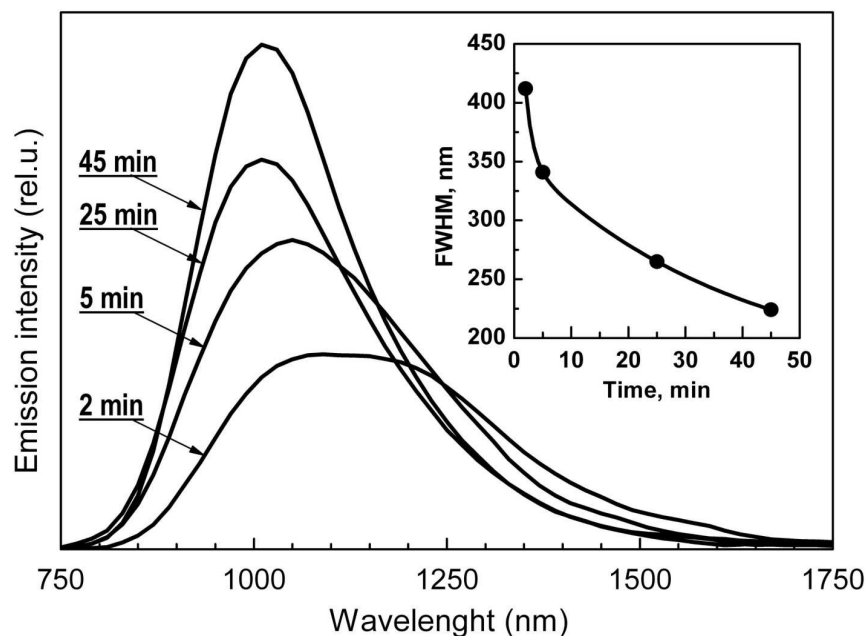
**Figure S2.** Absorbance and PL spectrum for  $\text{Ag}_2\text{Se}$  nanocrystals, synthesized with addition of tin (II) bis[bis(trimethylsilyl)amide]



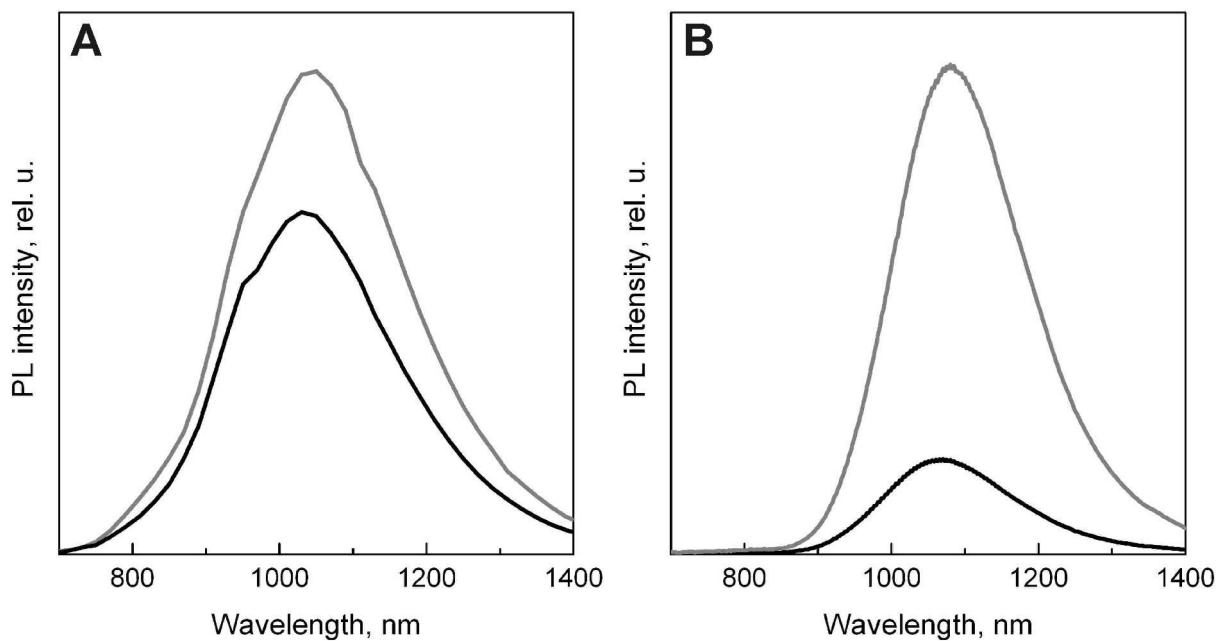
**Figure S3.** Absorbance (A), and EDX spectrum (B) of Ag nanocrystals. The vertical lines in B give the theoretical positions of the chalcogene lines which are clearly not present in our colloidal solution. Inset (A): photo of the Ag NC solution.



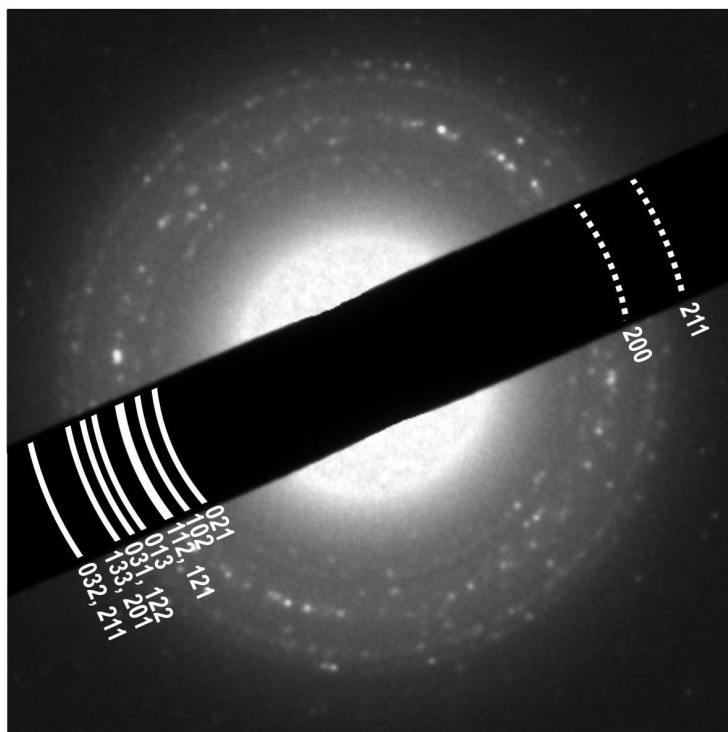
**Figure S4.** Absorption spectra of differently sized  $\text{Ag}_2\text{Se}$  nanocrystals. Inset: linear dependence of the absorbance peak position in respect to the Ag/Se molar ratio, evidencing a size control by the Ag/Se molar ratio.



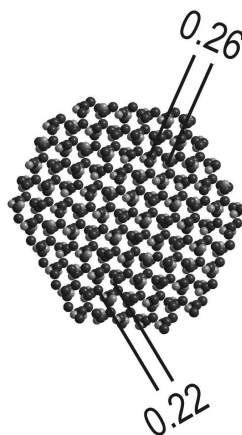
**Figure S5.** PL spectra of samples with different growth times (synthesis at 70 °C), evidencing a size focusing with time.



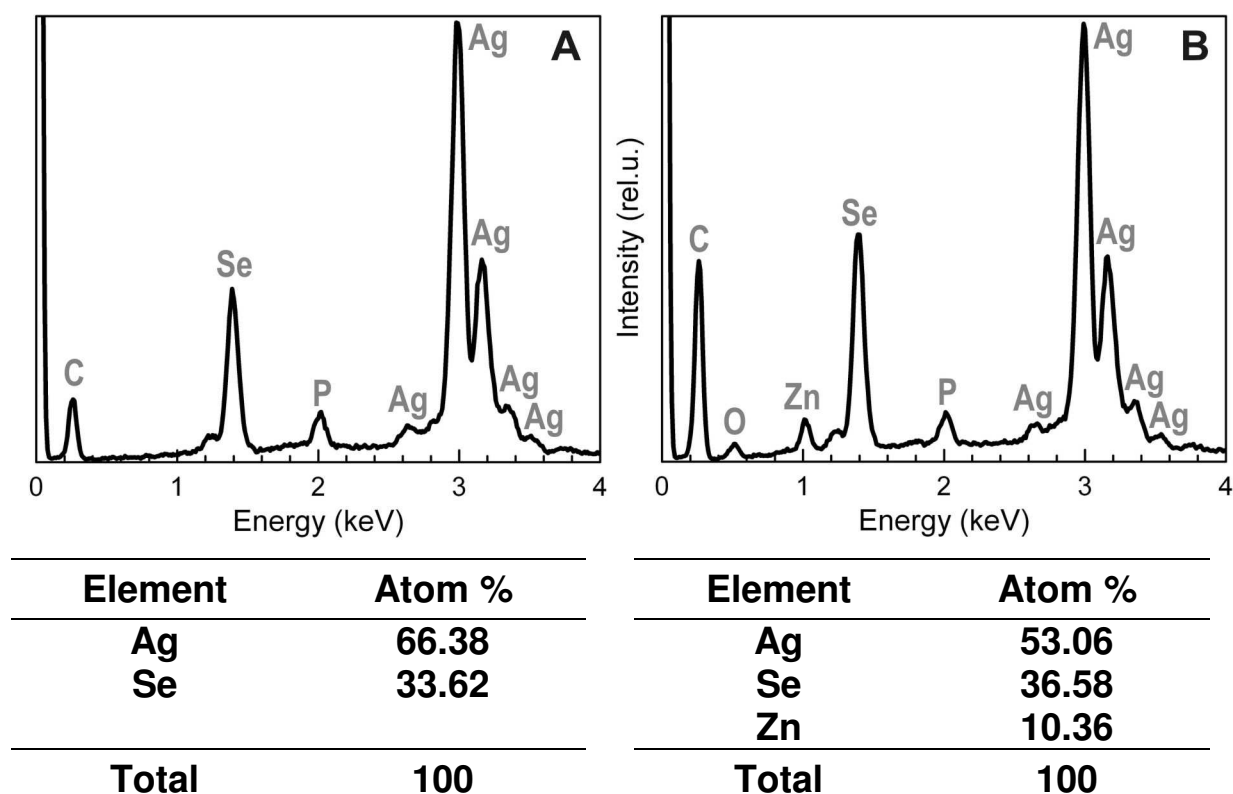
**Figure S6.** PL spectra of  $\text{Ag}_2\text{Se}$  (black lines) and  $\text{Ag}_2\text{Se}/\text{ZnSe}$  core/shell nanocrystals (gray lines), measured after synthesis (A) and after 6 months of storing (B).



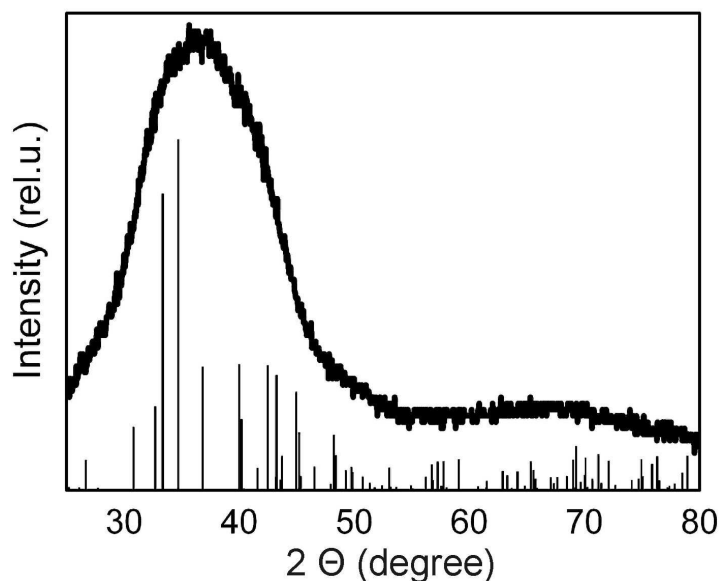
**Figure S7.** Selected area electron diffraction (SAED) of  $\text{Ag}_2\text{Se}$  nanocrystals, suggesting the presence of the low-temperature  $\alpha$ - $\text{Ag}_2\text{Se}$  crystal structure (solid arcs), and an absence of high-temperature  $\alpha$ - $\text{Ag}_2\text{Se}$  (dashed arcs).<sup>1,2</sup>



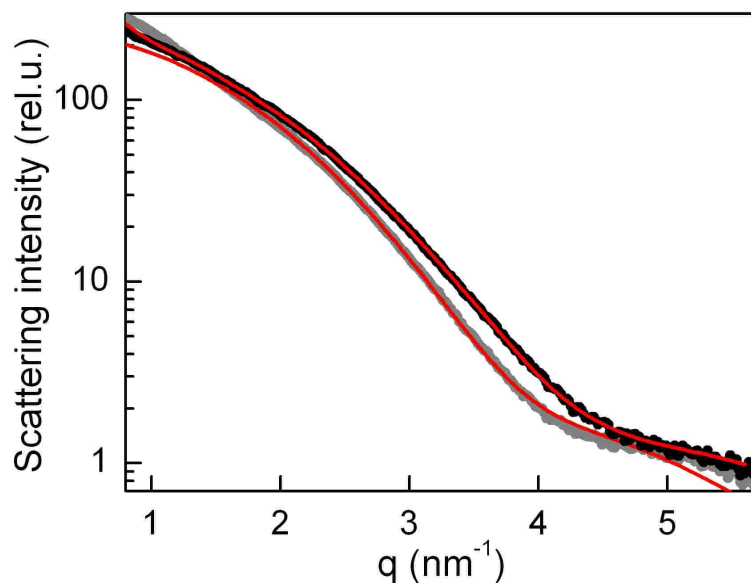
**Figure S8.** Theoretical atom arrangement in  $\beta$ -type (low temperature modification)  $\text{Ag}_2\text{Se}$  (as simulated for Figure 2C).



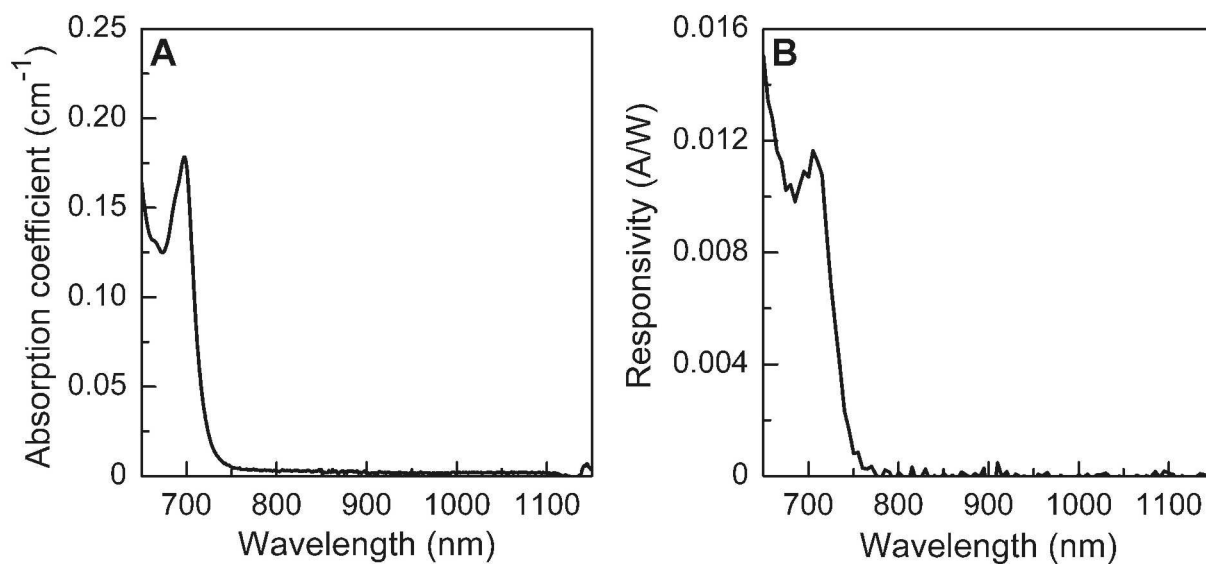
**Figure S9.** EDX spectra of (A) Ag<sub>2</sub>Se nanocrystals, and (B) Ag<sub>2</sub>Se/ZnSe core shell nanocrystals with quantifications of elemental contents.



**Figure S10.** Wide angle X-ray scattering (WAXS) spectrum of the 2.0 nm Ag<sub>2</sub>Se nanocrystals compared to theoretical spectrum for bulk Ag<sub>2</sub>Se (low-temperature phase).<sup>1</sup>

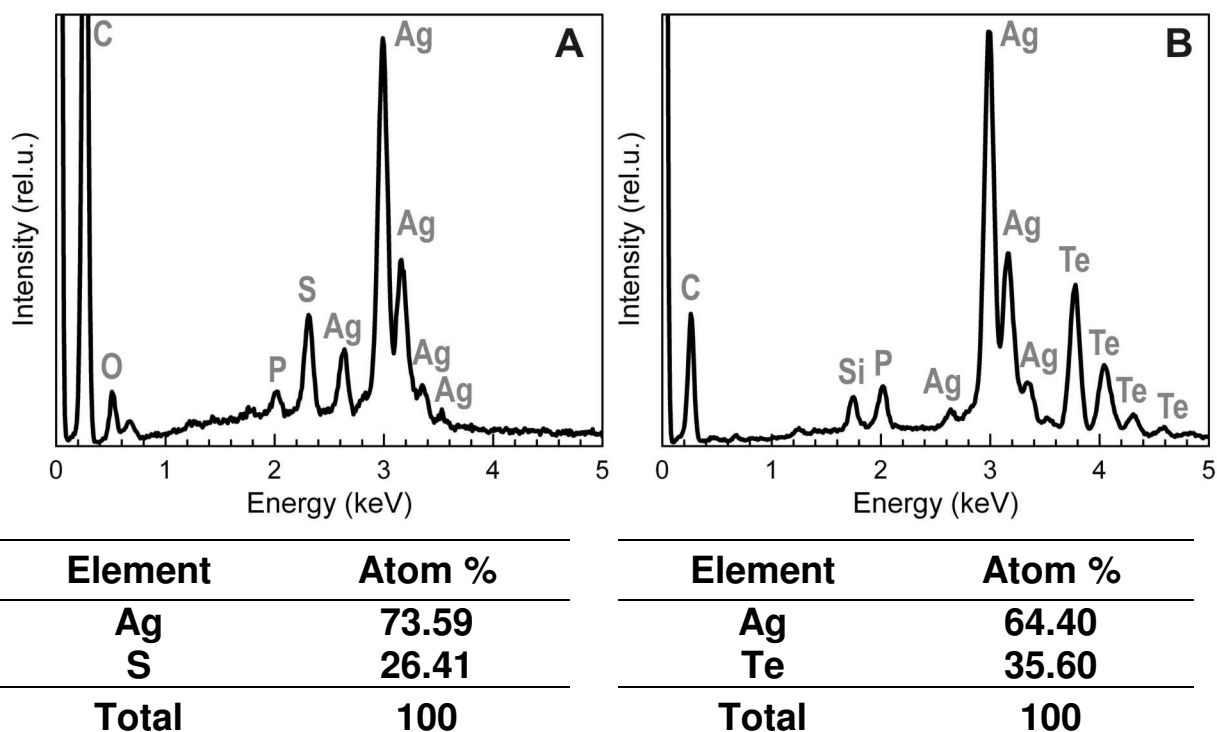


**Figure S11.** SAXS spectra of the 2.0 nm  $\text{Ag}_2\text{Se}$  nanocrystals (black dots), and 2.2 nm  $\text{Ag}_2\text{Se}/\text{ZnSe}$  core/shell nanocrystals (gray dots), together with fits (red lines).

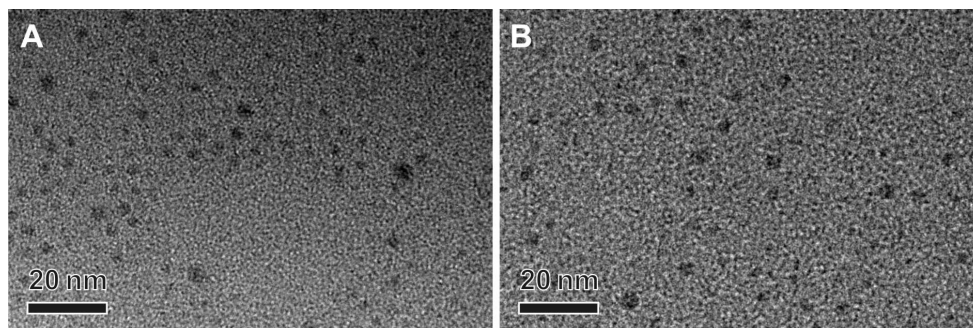


**Figure S12.** Absorption spectrum of PCBM solution in chlorobenzene (A), and photoresponse of PCBM film deposited on interdigitate gold electrodes (B).

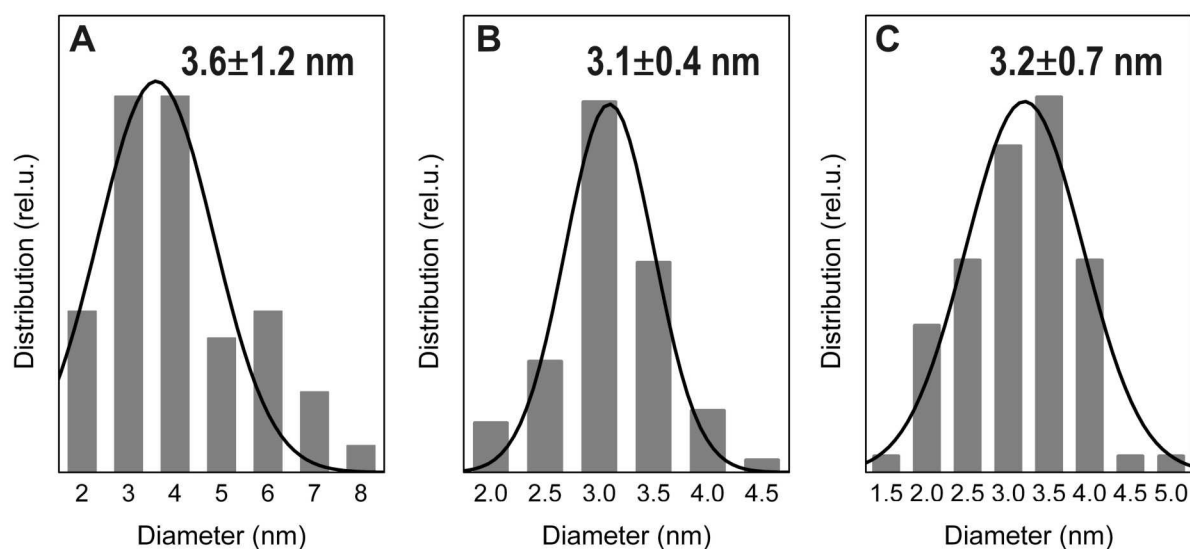




**Figure S13.** EDX spectra of (A)  $\text{Ag}_2\text{S}$  nanocrystals, and (B)  $\text{Ag}_2\text{Te}$  nanocrystals with quantifications of elemental contents (silicon was used as substrate).



**Figure S14.** TEM images of (A)  $\text{Ag}_2\text{S}$  nanocrystals, and (B)  $\text{Ag}_2\text{Te}$  nanocrystals synthesized with addition of lithium bis(trimethylsilyl)amide.



**Figure S15.** Size histograms for Ag<sub>2</sub>S (A-B), and Ag<sub>2</sub>Te nanocrystals (C) taken from TEM images, and fitted by Gauss distributions.

#### References:

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- 2 Oliveria, M.; McMullan, R. K.; Wuensch, B. J. Single crystal neutron diffraction analysis of the cation distribution in the high-temperature phases  $\alpha$ -Cu<sub>2-x</sub>S,  $\alpha$ -Cu<sub>2-x</sub>Se, and  $\alpha$ -Ag<sub>2</sub>Se. *Solid State Ionics* **1988**, 28-30, 1332-1337.